4 Inferencia condicional

- Inferencia condicional: la ddp de la hipotesis nula es derivada condicionalmente a los datos
- Permutation tests
  - Dos variables continuas
  - Una categorica y otra continua
  - Las dos son categoricas

- Medidas continuas en dos grupos

$$x = 1 \text{ or } x = 2$$

$$T = \frac{\sum_{i=1}^{n} I(x_i = 1) y_i}{\sum_{i=1}^{n} I(x_i = 1)} - \frac{\sum_{i=1}^{n} I(x_i = 2) y_i}{\sum_{i=1}^{n} I(x_i = 2)}.$$

Estadistico centrado en cero

- Permutamos las y N veces, y obtenemos la ddp de la hipotesis nula
- y rankeos → Wilcoxon Mann-Witney

- Dos variables nominales: tabla de contingencia

$$n_{ij} = \sum_{i=1}^{n} I(x_i = j) I(y_i = k)$$

$$X^2 = \sum_{j=1}^{r} \sum_{k=1}^{c} \frac{(n_{jk} - E_{jk})^2}{E_{jk}}. \qquad E_{jk} = n_{j.} n_{.k} / n$$

Distribucion exacta mediante el test de Fisher

Caso 1

In the room width estimation experiment reported in Chapter 3, 40 of the estimated widths (in feet) of 69 students and 26 of the estimated widths (in metres) of 44 students are tied. In fact, this violates one assumption of the *unconditional* test procedures applied in Chapter 3, namely that the measurements are drawn from a continuous distribution. In this chapter, the data will be reanalysed using conditional test procedures, i.e., statistical tests where

- Calculo del estadistico

```
 > data("roomwidth", package = "HSAUR2")
> convert <- ifelse(roomwidth$unit == "feet", 1, 3.28)
> feet <- roomwidth$unit == "feet"
> metre <- !feet
> y <- roomwidth$width * convert

> T <- mean(y[feet]) - mean(y[metre])
```

- Genera la ddp de la hipotesis nula

```
 >meandiffs <- double(9999)
> for (i in 1:length(meandiffs)) {
+ sy <- sample(y)
+ meandiffs[i] <- mean(sy[feet]) - mean(sy[metre])
+ }
```

```
  >hist(meandiffs)
 > abline(v = T, lty = 2)
 > abline(v = -T, lty = 2)
```

- Test de la hipotesis nula

```
greater <- abs(meandiffs) > abs(T)

mean(greater)

binom.test(sum(greater), length(greater))$conf.int
```

- Tests exactos

```
 >library("coin")
> independence_test(y ~ unit, data = roomwidth,
+ distribution = exact())
```

```
 >wilcox_test(y ~ unit, data = roomwidth,
+ distribution = exact())
```

Caso2

Mann (1981) reports a study carried out to investigate the causes of jeering or baiting behaviour by a crowd when a person is threatening to commit suicide by jumping from a high building. A hypothesis is that baiting is more likely to occur in warm weather. Mann (1981) classified 21 accounts of threatened suicide by two factors, the time of year and whether or not baiting occurred. The data are given in Table 4.1 and the question is whether they give any evidence to support the hypothesis? The data come from the northern hemisphere, so June–September are the warm months.

```
R> data("suicides", package = "HSAUR2")
R> fisher.test(suicides)
```

Caso 3

The administration of non-steroidal anti-inflammatory drugs for patients suffering from arthritis induces gastrointestinal damage. Lanza (1987) and Lanza et al. (1988a,b, 1989) report the results of placebo-controlled randomised clinical trials investigating the prevention of gastrointestinal damage by the application of Misoprostol. The degree of the damage is determined by endoscopic examinations and the response variable is defined as the classification described in Table 4.2. Further details of the studies as well as the data can be found in Whitehead and Jones (1994). The data of the four studies are given in Tables 4.3, 4.4, 4.5 and 4.6.

Table 4.2: Classification system for the response variable.

Classification	Endoscopy Examination
1	No visible lesions
2	One haemorrhage or erosion
3	2-10 haemorrhages or erosions
4	11-25 haemorrhages or erosions
5	More than 25 haemorrhages or erosions or an invasive ulcer of any size

- Exploracion

```
 > data("Lanza", package = "HSAUR2")
> xtabs(~ treatment + classification + study, data = Lanza)
```

- Test

```
 > library("coin")
> cmh_test(classification ~ treatment, data = Lanza,
+ scores = list(classification = c(0, 1, 6, 17, 30)),
+ subset = Lanza$study == "I")
```

```
 > cmh_test(classification ~ treatment, data = Lanza,
+ scores = list(classification = c(0, 1, 6, 17, 30)),
+ subset = Lanza$study == "II")

 > p <- cmh_test(classification ~ treatment, data = Lanza,
+ scores = list(classification = c(0, 1, 6, 17, 30)),
+ subset = Lanza$study == "II", distribution =
+ approximate(B = 19999))
> pvalue(p)

 > cmh_test(classification ~ treatment, data = Lanza,
+ scores = list(classification = c(0, 1, 6, 17, 30)),
+ subset = Lanza$study == "III")

 > cmh_test(classification ~ treatment, data = Lanza,
+ scores = list(classification = c(0, 1, 6, 17, 30)),
+ subset = Lanza$study == "IV")

 > cmh_test(classification ~ treatment | study, data = Lanza,
+ scores = list(classification = c(0, 1, 6, 17, 30)))
```

Caso 4

Newborn infants exposed to antiepileptic drugs in utero have a higher risk of major and minor abnormalities of the face and digits. The inter-rater agreement in the assessment of babies with respect to the number of minor physical features was investigated by Carlin et al. (2000). In their paper, the agreement on total number of face anomalies for 395 newborn infants examined by a paediatrician and a research assistant is reported (see Table 4.7). One is interested in investigating whether the paediatrician and the research assistant agree above a chance level.

```
> anomalies <- c(235, 23, 3, 0, 41, 35, 8, 0, 20, 11, 11, 1, 2, 1, 3, 1)
> anomalies <- as.table(matrix(anomalies,
+ ncol = 4, dimnames = list(MD = 0:3, RA = 0:3)))
> anomalies
```

```
> mh_test(anomalies)
```

```
> mh_test(anomalies, scores = list(c(0, 1, 2, 3)))
```